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ENTOMOLOGICAL NEWS

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Sclerotizations in the Lateral Body Wall of the Nymphal Abdomen in Odonata

By ERICH SCHMIDT, Bonn (Rhein), Mozartstr. 22, Germany

In 1893, when Dr. PHILIP P. CALVERT published his well known catalogue with its important introduction, he was probably the first to mention the pleura of the nymphs of dragonflies, when he stated (p. 198): "The pleura are equally well chitinized as the large terga and sterna; in the *Zygoptera* they are infolded, in the *Anisoptera* exposed to view on the ventral surfaces." This condition was similarly described and somewhat expanded by TILLYARD (1917, p. 88): "The pleura (of the larva) differ from those of the imago in being strongly chitinized. In the *Anisoptera* they form flat side-pieces to the sterna; in the *Zygoptera* they are infolded. Eight pairs of abdominal spiracles are present, the eighth being the largest. Their positions near the anterior margins of the pleura, close to the terga, correspond with those of the imago."

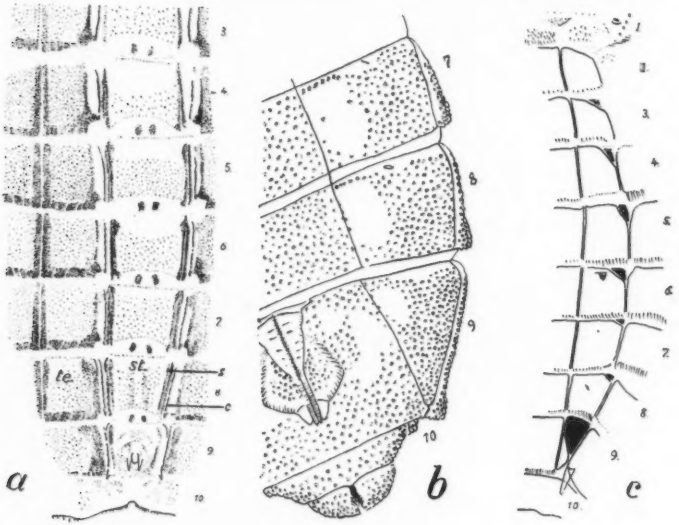
For a long time I have believed that which I expressed in my paper of 1915 (p. 100, translated): "In the larvae of the *Anisoptera,* in place of the imaginal pleural folds, there are found regular pleurites that lie ventrally and laterally to the sternite, and are separated from both sternite and tergite by conspicuous sutures. These pleurites resemble the sternites and tergites in color and they are characterized by the spiracle that lies within them. The nymphs of the *Zygoptera* do not show any such conditions; the boundaries of the tergite and sternite against the pleural membranes are indistinct. In *Euphaea,* the lateral gills lie in the pleural membranes." This opinion concerning the condition in the larvae of *Zygoptera*

was later verified by GARMAN (1917, p. 422): "Each body-ring (of the larvae of *Zygoptera*) is without sutures but is roughly divided by the lateral carinae into sternal and tergal areas." Therefore I was somewhat astonished when, in a paper by WHEDON (1919, pl. XXI, fig. 1), I found a line (*spls*) drawn which was explained as a sterno-pleural suture. Hence, for my own information, I made a preparation of a luxuriously coloured exuviae of *Lestes sponsa* (fig. 1a), in which inside of the lateral carina of segm. 4–8 there was visible a light, irregularly bounded, narrow stripe which perhaps may be considered as a suture. The space between the carina (c) and this suture may be that which corresponds to the "pleurites" of anisopterous larvae; it is a very narrow dark stripe, however, that, in accordance with its coloration, should not be as soft as neighboring parts.

The conditions of these sclerites of anisopterous larvae, considered hitherto to be pleurites, are illustrated in several places in the literature, for instance by CABOT (1890, pl. V, fig. 2a, for *Cordulia* sp.), by BERLESE (1909, fig. 403, for *Aeschna grandis*), WALLENGREN (1914, fig. 3, for *Aeschna*), TILLYARD (1917, fig. 29 B, for *Aeschna brevistyla*), by WHEDON (1919, fig. 8, for *Anax junius*, 13 and 16 for *Tramea carolina*, fig. 30, for *Hagenius brevistylus*), CALVERT (1929, fig. 6, 7, for *Anax junius*), the present writer (1936, t.fig. 4a-f, 10a, b, for some European Gomphids; 1937, t.fig. 11–14, for some *Aeschna* sp.). These ilustrations mostly agree in showing the supposed pleurites as a uniform sclerite, except WALLENGREN (p. 6, fig. 3), who figured sclerotizations of segm. 5 and 6, apparently of *Aeschna grandis*, and showed that in segm. 4–8 "the pleurites are divided into two plates, a small anterior *episternite* (fig. 3, *Ep*) and a greater, posterior, lower, *epimerite* (*Hp*) that borders upon the sternite. The episternite is, namely, situated between the anterior ends of the epimerite and the tergite."

Such was the usual view twenty years ago concerning these lateral sclerites between the dorsal and ventral plates. In 1933, WEBER wrote (p. 203, translated): "The sclerites that occur, not rarely, in the lateral membranes and that are often

designated as pleurae have in reality nothing to do with thoracic pleurae (*subcoxae*), but are secondary formations, if they have not, indeed, been derived from the terga." Hence, it seems better not to adopt such terms as epimerite and



TEXT FIGURE 1

a. *Lestes sponsa* Hansem. ♂, abdomen of exuviae, last instar, cut dorsally and exfolded.

b. *Epiophlebia superstes* (Selys), ♀ exuviae, penultimate instar, left side of end of abdomen from ventral side.

c. *Oxygastra curtisi* (Dale). Exuviae, last instar, left side of abdomen, seen from ventral side. Victory River, mouth, near Bonn; 21, vi, 1942, leg. et ded. H. Fastenrath.

c, lateral carina; *s*, sterno-pleural suture; *st*, sternite; *te*, tergite; 1–10, number of abdominal segments; *tr. scl.* marked in solid black.

episternite but to use non-committal topographic words. We therefore propose for the greater sclerite, formerly named epimerite, the term *"spiracular sclerite,"* abbreviated spir. scl., because it bears (but not in segm. 9) the spiracle; and for the smaller sclerite, formerly named episternite, the term *"triangular sclerite,"* abbreviated tr. scl., derived from its shape.

Before entering into a detailed comparison of these sclerites in several larvae of *Anisoptera,* which will show an unexpected differentiation in single families and even in genera, some general features should be mentioned:

a) The *tr. scl.* is usually missing in segm. 9 with one exception (*Oxygastra,* see below), and there is generally a uniform and undivided plate, without a spiracle. In *Cordulegaster,* however, even this plate is absent (see below).

b) Furthermore, the coloration, and correspondingly the sclerotization, decreases more and more *in the abdominal segments nearer the thorax* so that it becomes difficult to recognize a suture separating the sclerites. Hence, we shall turn our attention more to the segments of the middle and caudal parts of the abdomen.

c) In many specimens, especially in those dwelling on the bottom, the area near the intersegmental fold is often covered with mud that adheres so firmly between the hairs or bristles of the skin as to form a nearly insuperable obstacle to a pin used to clean the fragile surface of such a valuable skin, even after having softened it with some liquid such as alcohol or water. Hence, its practical value for use in differentiating species is doubtful, since more easily visible characters are often available.

d) To date, we have compared mostly the last instars of larvae, as others were not collected. Surely, the younger stages, especially in the *Libellulinae,* should also be studied.

1. The following comparison was suggested especially from our wish to learn the conditions of sclerotization in the lateral body wall of the abdomen of the strange Japanese *Epiophlebia superstes* (Selys), which, together with several fossils, is now considered to form a special suborder of the Odonata (HANDLIRSCH, 1906, p. 465). The discoverey of its nymph by ESAKI, probably in 1923, gave me the idea of writing to Japanese colleagues asking them for a statement concerning this matter, or to send me a cast larval skin. It was not until some months ago, however, that I was fortunate enough to receive two larval skins, a male and a female, both of the penultimate instar, through the kindness of that capable Japanese student SYOZIRO ASAHINA

in Tokyo, to whom I am very much indebted. These skins showed at once strongly sclerotized plates quite similar to those in most *Anisoptera;* scl. spir. on segm. 2–9, missing in segm. 1 and 10 (fig. 1b). Spiracles are visible on segm. 1–8. The surface of the ventral side is covered with numerous tubercles, and, though it seemed to be sufficiently clean, no suture separating a *tr. scl.* was visible. The structural conditions, however, approach the conditions found in *Anisoptera* more than those in *Zygoptera.*

2. In general, the greatest number of *tr. scl.* seems to occur regularly in the nymphs of *Aeschnidae,* where they appear on segm. 4–8, as stated by WALLENGREN (1914, p. 6), or also on segm. 3 (fig. 2a). Variation in the segments supplied with the *tr. scl.* was not observed except for segm. 3, but perhaps the size of the sclerites may be somewhat different in single forms. Surely, the *tr. scl.* in this family are smaller than in most *Libellulidae* and some *Gomphidae* (see below). In segm. 8, the oral and inner side of *tr. scl.* is relatively long; nearer to the base of the abdomen its oral side becomes gradually shorter, the outer side longer. On the anterior side of *spir. scl.* of *Anax* (fig. 2a) a transverse groove was observed, which was not found in *Aeschna.*

3. Larvae of *Petaluridae* were not accessible now, and a younger larva of *Phyllopetalia stictica* Selys showed the *tr. scl.* on segm. 6–8 only, but it may exist also on the anterior segments. In SCHMIDT, 1941, pl. 2, fig. 2, a full grown nymphal skin of *Phenes raptor* Ramb. was figured, showing the row of *spir. scl.* on segments 2–8; oblique lines visible may perhaps correspond to sutures, or may not. On the same plate, fig. 4 shows distinctly the row of *spir. scl.* on segments 3–9 of a last instar exuviae of *Hypopetalia pestilens* McL.; no oblique sutures are visible. Text figs. 9d and 11c, e, show segm. 8–10 of younger instars of *Petaliids* from Chili with conditions similar to *Aeschnidae,* but no oblique suture is visible in the figures.

4. Of the larvae of *Gomphidae,* which all seem to live on the bottom, I studied at first a skin of *Gomphus pulchellus* without success in discovering any oblique suture, but later, after having compared several other forms, I came to the conclusion that the

tr. scl. in this family seems to be restricted to segm. 7 and 8 only. I found this condition in *Ictinus* (*decoratus* and *pertinax*, fig. 2b), *Leptogomphus* (*Sauteri* and *Lansbergei*), *Archaeogomphus* sp. from Nova Teutonia, Brasil, *Dromogomphus spinosus, Burmagomphus Laidlawi* (det. et ded. Dr. F. C. Fraser), and here the sutures were easily visible in dry material. In a study of a series of exuviae of North American *Gomphus*, received from and identified by Dr. E. M. WALKER, after cleaning them or not, I was able to find the *tr. scl.* on segm. 7 and 8 in *G. villosipes, brevis, quadricolor, spicatus, furcifer, fraternus*, and at last the sutures were discovered also in a somewhat cleaner specimen of *G. pulchellus*, so that it seems that the problem of the presence or absence of the *tr. scl.* will become merely a question of sufficient cleaning of the sclerite's surface; but this is a very dangerous task in such precious skins, where the pin mostly inclines more to penetrate and destroy the skin than to clean its surface. Up to date, I have been unable to find the sutures in *Gomphus vulgatissimus* and *G. flavipes, Ophiogomphus serpentinus* and *Onychogomphus forcipatus*, and I wonder, whether it may be present or not even in *Hagenius brevistylus*.

5. A female exuvia of *Cordulegaster annulatus* was cleaned and mounted in Fauvre's fluid. I was much surprised to discover that the *spir. scl.* was missing here even in segm. 9, where it is present in all other *Anisoptera* studied, and even in *Epiophlebia*. *Tr. scl.* was present in segm. 4–8, always of moderate size, but somewhat contrasting in shape to the condition in the *Aeschnidae* (fig. 2a), when compared on the segments nearer to the thorax (fig. 2c).

TEXT FIGURE 2

a–f, Left parts of abdomens, seen from ventral side, of last instar exuviae of Anisoptera; a and c are from preparations in Fauvre's fluid; b, d–f are from dry skins; *tr. scl.* represented by solid black.

a. *Anax imperator* Leach, ♀. Ennertsee near Bonn, 1941.

b. *Ictinus pertinax* Selys, ♂. Central Formosa, 8, vi, 43, leg. M. Chujo.

c. *Cordulegaster annulatus* Latr., ♀. Upper Roer between Kalterherberg and Reichenstein, 21, vi, 41.

d. *Cordulia aenea* (Linn.), ♀. Ennertsee near Bonn.

e. *Crocothemis erythraea* (Brullé), ♂. Asprochoma near Kalamáta, Greece, 3, vi, 39.

f. *Zygonyx iris* Selys, ♀. Tonkin, 1924, det. Dr. F. C. Fraser.

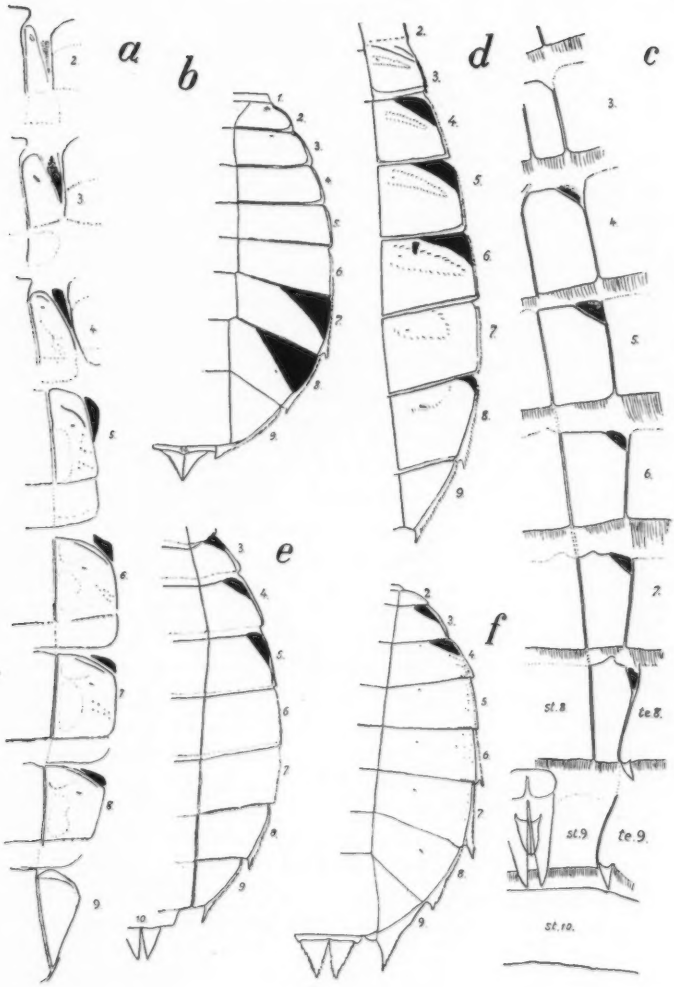


FIGURE 2

6. In the skins of *Corduliinae* studied the *spir. scls.* were always present on segm. 2–9, but the *tr. scl.* showed a surprisingly different condition, furnishing a scale more extended than in any other family and perhaps of phyletic importance within the *Anisoptera.* This will probably become more evident when other important forms such as the nymphs of *Petaluridae,* and some Australian *Corduliinae* will have been compared. Very probably, forms with *tr. scls.* on many (all middle) segments, as in *Aeschnidae,* will show a more primitive condition than those in which the sclerite is reduced to only a few segments, as especially in *Gomphidae* and *Libellulinae* (see below).

a). In our material, we consider as most primitive (of all studied *Anisoptera*) the remarkable condition in *Oxygastra Curtisi* (fig. 1c), in which the *tr. scl.* was found on segm. 3–9, that is, on more segments than in any other observed form. These sclerites are very small in segm. 3, 7 and 8, larger in the others, and largest in segm. 9. No spiracle, however, was found on segm. 9, just as in all other *Anisoptera.* The size and form of *tr. scl.* of segm. 9 of *Oxygastra* makes it probable that the sclerite on segm. 9 of other *Anisoptera* (except *Cordulegaster* again) will be a *tr. scl.* and not a *spir. scl.* as previously supposed! *b*). *tr. scl.* on segm. 4–8: *Somatochlora arctica; c*). on segm. 4–6 and 8: *Cordulia aenea,* which has a longitudinal oblique hump on *spir. scl.,* bearing the spiracle (fig. 2d); other *Somatochlora* sp. (*metallica, flavomaculata, alpestris, cingulata, williamsoni*); *d*). *tr. scl.* on segm. 4–6 only: *Neurocordulia yamaskanensis; e*). on 4–5 only: *Tetrageneuria cynosura; f*). on 3–6: *Procordulia* sp. from Java; *g*). 3–4 only: *Epicordulia regina; h*). *tr. scl.* wholly absent: *Macromia* (*illinoiensis* with a large hump on *spir. scl., clio*), *Didymops transversa* (with a lower hump), and *Epitheca bimaculata.*

7. Similarity in general appearance, along with minor differences, seems to characterize the *Libellulinae,* but never more than 3 pairs of *tr. scl.* were discovered. In most cases I found this sclerite on segm. 3–5; for instance, in the 3 European *Libellula* spp., *Orthetrum cancellatum, Perithemis tenera* (NEEDHAM ded. et det.), *Crocothemis erythraea* (fig. 2e), *Sympetrum meridionale* and *scoticum, Pachydiplax longipennis,* in 4 European

Leucorrhinia spp. (not in *L. caudalis*), *Trithemis annulata*. The following exceptions were found: *Zygonyx iris* (det. Dr. F. C. FRASER, fig. 2f) and *Pantala flavescens* had the *tr. scl.* on segm. 3–4, and even *Leucorrhinia caudalis* only on 3.

When preparing the skins (cutting off the dorsal cover and of segm. 10 + appendices, putting away the rectal skin and longitudinal stems of tracheae, then cleaning and mounting in Fauvre's fluid), I saw a pair of *apodemes* of respectable length on the anterior border of *spir. scl.*, vertical to the body surface, each laterally, on both sides, entering the interior cavity. Such apodemes were found on segm. 6 of *Oxygastra Curtisi* (fig. 1c) and *Cordulia aenea* (fig. 2d)—in both figures marked with punctures, in the Fauvre's fluid preparation it was folded back by the pressure of the coverglass—and on segm. 4–6 in *Gomphus pulchellus;* they were not seen in *Cordulegaster, Aeschna cyanea, Anax imperator* and *Sympetrum scoticum*. "There is every reason for believing that sclerites have been correlated with muscles in their evolution, if not necessarily in their origin" (SNODGRASS, 1931, p. 5). In consequence of this we may suppose, that sclerotization in the lateral region of the larval abdomen is correlated with the greater number of muscles there than in the imaginal abdomen, and the development of *tr. scl.* should correspond to this condition also. But, although we are fortunate enough to possess some fine and careful studies on abdominal musculature of *Anisoptera,* and although some muscles are described attaching on "pleural" parts, we were unable to find any muscle on *tr. scl.*, neither in WALLENGREN (1914), who discovered the *tr. scl.* in *Aeschna grandis,* nor in WHEDON (1919), who studied *Anax junius* and *Tramea carolina,* nor in FORD (1923), whose subject was *Libellula 4-maculata,* so that it is probable that no muscle is attached to *tr. scl.* Perhaps such a muscle may still persist in forms in which the *tr. scl.* is of a larger size, as in *Cordulia aenea,* but to date we can only suppose that in the absence of muscles adhering to the sclerite, the latter has lost its function. Here, as in other known instances, a relatively primary and ancient condition may be preserved longer in a minute functionless organ than in an appendage exposed to influences from the outside (cf. RIS, 1916, p. 109 f.).

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Oligoclada calverti n. sp. (Odonata: Libellulidae)

NEWTON DIAS DOS SANTOS, Museu Nacional, Rio de Janeiro, Brasil

O presente trabalho foi escrito com a intenção de participar do volume de *Entomological News* a ser editado em comemoração do 80º, aniversário do Professor Philip P. Calvert, professor emérito da Universidade de Pensilvania e que, ha cerca de 55 anos, se vem dedicando com eficiência e dedicação, ao estudo dos odonatas neotropicais de que é o mais completo conhecedor.

Considero-me feliz de poder associar-me a estas manifestações de afeto, reconhecimento e simpatia ao mestre, a quem devo tantas atenções e ajuda, e a quem desejo muitas felicidades e anos de vida.

Oligoclada calverti n. sp.

Coloração: lábio preto; labro e clipeo amarelo, porém o postclipeo com os cantos enegrecidos; fronte e vértex azul metálico brilhante; occipute preto; tórax e patas com puinescência azulada; abdomen bruno escuro, com reflexos azulados; asas hialinas, membrânula cinza; ptrostigma preto.

Oustros caracteres: fronte com furca mediana pouco profunda, arredondada e com quina anterior pouco nítida; vértex convexo; occipute sem projeções lateraes; dente da unha subterminal, tão desenvolvido come em *Oligoclada borrori;* carina transversal presente no 4º segmento abdominal.

Nervação: antenodais, na asa anterior, 9,5; na asa posterior 7; postnodais, na asa anterior, 7–8; na asa posterior, 8; árculo entre a 1ª, e 2ª antenodal, proximal do meio; triângulo livre; subtriângulo com 3 células; campo discoidal, na asa anterior, alargando-se um pouco para a margem, com duas séries de células numa distância de 5 células e daí seguido por três séries que aumentam até seis na margem; na asa posterior, com uma série de 3–4 células, seguida por duas séries e por um numero sempre crescente de células até a margem; *bcv* extras, ausentes; *cu. a.* 1; *Rspl* com 5–6 células; *Mspl* ausente; alça anal desenvolvida, sem célula intercalar no canto anal do tri-

ângulo e presente no calcanhar; metade basal com 9–10 células; metade distal com 11 células; *CuP* e *A1* muito separadas na origem; entre *A2* e a margem, 3 séries de células, ao nivel do triângulo.

Genitália: vide figuras.

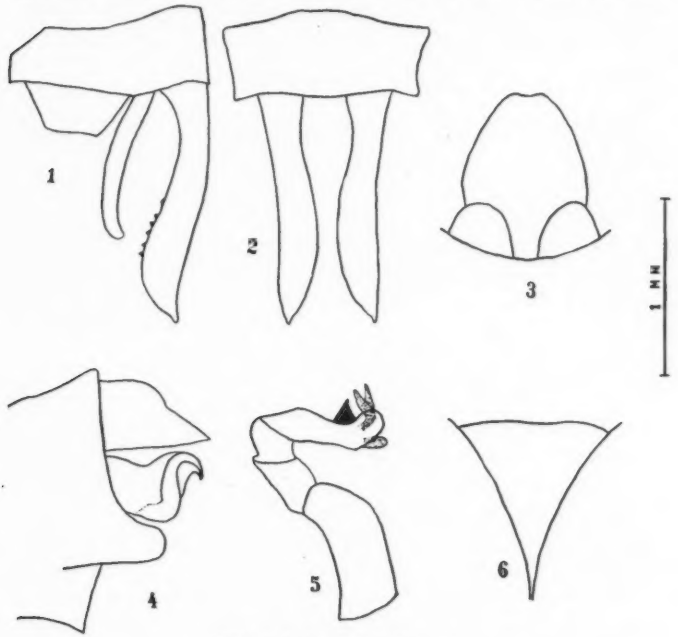
Medidas: ♂; asa anterior 25 × 6, 5 mm; asa posterior, 24 × 8, 5 mm; abdomen (até o 4º segmento), 7 mm; o resto do abdomen foi perdido após estudos.

Material estudado: HOLOTYPUS ♂, no. 10.017, Riacho do Quebra, Lagôa Santa, Minas Gerais, Santos & Machado e Berla col., fevereiro de 1947 (na coleção de o donata do Museu Nacional).

Esta éspecie pelo subtriângulo com 3 células, última antenodal incompleta, carina transversal do 4*o.* segmento abdominal, pelo aspecto do pênis e direção do dente do hâmulo, enquadra-se no grupo IV de Borror, formado por *Oligoclada heliophila* Borror, 1931 e *Oligoclada raynei* Ris, 1919, de cujo grupo porém, não participa pela ausência de projeções laterais do occípute; por êste caracter e pela forma do pênis, verifica-se ser esta espécie intermediária entre o grupo IV e os grupos V e VI de Borror, diferindo, porém, dêsses grupos, pela posição do dente do hâmulo, em direção caudal. Na mesma situação dessa nova espécie, enquadra-se *Oligoclade haywardi* Fraser, 1947, proveniente de Pôrto Iguassú, Território das Missões, Argentina. Fraser deixou de mencionar caracteres importantes para a caracterisação desta espécie, bem como não figurou o pênis, carácter decisivo para o reconhecimento dos grupos naturais, nêsse gênero. Segundo Fraser, *O. haywardi* é aliada de *O. abbreviata* (Rambur, 1842) o que porém, não se pode justificar, segundo demonstra a própria figura *3f* dada por Fraser em seu trabalho onde se verifica que o dente do hâmulo dirige-se em posição caudal. Sendo o pênis de *O. abbreviata* de forma espetacular dentro do gênero, seria curioso conhecer o pênis de *O. haywardi.* Esta éspecie deverá ser filiada ao grupo IV de Borror, sendo estreitamente aliada a *O. calverti.* O lobo genital do *O. calverti* é muito menos agudo do que em *O. haywardi;* em *O. calverti* a lâmina anterior é mais alta do que larga (de perfil) ao passo que ao contrário se verifica em *O. haywardi. Oligoclada haywardi, O. calverti, O. heliophila, O. umbricola* e *O.*

nemesis são as espécies de maior estatura do gênero, a asa posterior alcançando 24 mm.

Esta nova espécie foi penosamente procurada no riacho do Quebra e nos arredores de Lagôa Santa e Rio das Velhas, sem



Oligoclada calverti n. sp.

Fig. 1: Apêndices anais, vista lateral (Holotypus)
Fig. 2: Apêndices anais, vista dorsal (Holotypus)
Fig. 3: Apêndice anal inferior, vista ventral (Holotypus)
Fig. 4: Genitália do 2º segmento, vista lateral (Holotypus)
Fig. 5: Pênis, vista lateral (Holotypus)
Fig. 6: Occipute, vista do bordo posterior (Holotypus)

nenhum sucesse, nos meses de abril e dezembro de 1949. Enquanto *Oligoclada nemesis* é uma espécie tìpicamente das margens da Lagôa Santa, frequentando as associações de helófilas de *Heliocharis sp.*, *Oligoclada calverti* habita água menos biológicamente estabilizadas.

Correction to Notes on Some Aquatic Insects of the Brandywine Creek Drainage, Chester County, Pennsylvania

By JOHN W. H. REHN, Professor of Biology, Marlboro College; Research Associate, Academy of Natural Sciences of Philadelphia

Since the appearance of the basic report [1] and the supplement [2] I have been informed that specialists have examined some of the material and have corrected certain determinations. It is the purpose of this note to record these changes.

The determinations originally given are placed first and are followed by the revised one.

ODONATA [3]

Gomphus villosipes = *Gomphus spicatus.*

EPHEMEROPTERA [4]

Stenonema annexum, F = *Stenonema rubromaculatum* and several *Stenonema pulchellum* group.

Stenomena candidum = *Stenonema pulchellum* group and *Stenonema interpunctatum* group, near *carolina.*

Stenonema ithaca = *Stenonema rubromaculatum.*

Stenonema possibly *ithaca* = *Stenonema* possibly *rubromaculatum.*

Stenonema ohioense Al = *Stenonema* possibly *carolina.*

Baetidae = *Ephemerella deficiens.*

Baetis sp. = *Baetis* near *pluto.*

Pseudocloeon cingulatum = *Pseudocloeon* sp. (3 or 4 species probably represented).

[1] Ent. News, LXI, pp. 171–177 (1950).

[2] Ent. News, LXI, p. 203 (1950).

[3] Determined by Professor P. P. Calvert.

[4] Determined by Professor J. R. Traver.

TRICHOPTERA [5]

Neuroclipsis sp. Al = *Polycentropus* sp.

These changes slightly increase the number of forms found at station A, and add one to the total at station F. However, the conclusions originally presented still appear to be warranted.

A New Species of Uroxys from Peru (Coleoptera: Scarabaeidae)

By MARK ROBINSON, Research Associate, Department of Insects, The Academy of Natural Sciences of Philadelphia

Uroxys variabilis new species

This species differs from *productus* Arrow by the lack of a strong sulcus in the middle of the pronotum and the shape of the basal groove of the pygidium. From *cuprescens* Westwood it is distinguished by the lack of a strong angulation at the inner edge of the male anterior tibia. From both of the above species and all other species in the genus it can be separated by the apices of the male major elytra, which are very different. Thanks are due Dr. A. Martinez of Buenos Aires, Argentina, for confirming the status of this very interesting insect.

Male major. Elongate; shining; dark reddish, hairs light brownish.

Clypeus triangularly emarginate with a tooth on either side of the emargination. There is a shallow, longitudinal sulcus running back from the clypeal emargination. The eyes are large and are separated by about twice their combined width. The surface of the frons and clypeus is minutely punctured and microscopically alutaceous. The edge of the genae and clypeus are fimbriate.

[5] Determined by Professor H. H. Ross.

Side margins of the thorax are widest just back of the middle. Inside each side margin is a shallow, longitudinal sulcus. The pronotal punctures are a trifle larger in diameter than those on the head.

The apices of the elytra near the first to fourth striae are produced to the rear into rounded lobes. The striae are well indicated and regularly, crenately punctured. The intervals are barely convex. The surface of the intervals are punctured about the same as the pronotum.

The anterior femur is unarmed. The fore tibia is quite long and very thin near the base with the inner edge slightly flexuous. The outer edge is tridentate in the distal one-third. Anterior tibial spur slender, down bent in distal one-third to the acute apex. The suture between the mesosternum and the metasternum is acutely produced forward. Base of the pygidium has a nearly straight groove running from the middle toward each side.

Length, 10.0 mm.; breadth, 5.9 mm.

Male minor. Like the male major with the following exceptions. The apices of the elytra are rounded and not produced into lobes. The suture between the mesosternum and the metasternum is not produced as far forward as it is in the male major. Thorax is widest at the middle. The anterior tibia is shorter and not quite so thin in proportion.

Length, 7.3 to 8.5 mm.; breadth, 3.6 to 4.1 mm.

Female. Agrees with the male minor with the following exceptions. The thoracic side margins are widest before the middle. The anterior tibia is wider with the inner edge nearly straight while the outer edge is tridentate in the distal half. The anterior tibial spur of this sex is not as strongly curved downwards as it is in the male. Pygidium does not slant forward so acutely therefor the abdominal segments are wider along the center.

Current Entomological Literature

COMPILED BY R. G. SCHMIEDER

Under the above head it is intended to note papers received at the Academy of Natural Sciences of Philadelphia and the University of Pennsylvania, pertaining to the Entomology of the Americas (North and South), including Arachnida and Myriopoda. Articles irrelevant to American entomology will not be noted; but contributions to anatomy, physiology and embryology of insects, however, whether relating to American or exotic species will be recorded.

This list gives references of the year 1950 unless otherwise noted. Continued papers, with few exceptions, are recorded only at their first installment.

For other records of general literature and for economic literature, see the Bibliography of Agriculture, Washington, and the Review of Applied Entomology, Series A, London. For records of papers on medical entomology see Review of Applied Entomology, Series B.

NOTE: The figures within brackets [ ] refer to the journal in which the paper appeared, as numbered in the List of periodicals and serials published in our January and June issues. The number of the volume, and in some cases, the part, heft, &c. is followed by a colon (:). References to papers containing new forms or names not so stated in titles are followed by (*); if containing keys are followed by (k); papers pertaining exclusively to Neotropical species, and not so indicated in the title, have the symbol (S).

Papers published in ENTOMOLOGICAL NEWS are not listed.

Notice: Included below are many titles taken from the Proceedings of the Eighth International Congress of Entomology (1948), published in Stockholm under date of 1950. The abbreviated reference used below is [8th I. C.].

GENERAL—Bovey, P.—La variabilité des espèces et l'entomologie appliquée. [Bull. Soc. vaud. Sci. nat.] 64: 401–16. **Butler, C. G.**—A new design of microsyringe tip for the instrumental insemination of queen honey bees. [53] 166: 957–58. **Carvalhaes, J.**—Significado ecológico do mimetismo nos insectos. [Brotéria] 19 (47): 145–61. **Clark, E. W. and F. Morishita**—C-M medium: A mounting medium for small insects, mites and other whole mounts. [80] 112: 789–90. **Esaki, T.**—A zoogeographical consideration of the insect fauna in the Pacific islands. [8th I. C.] 373–79. **Forsslund, K. H.**—Über die Einsammlungsmethodik bei Untersuchungen der Bodenfauna. [8th I. C.] 770–72. **Handschin, E.**—Zur Entstehung der Quercyfossilien. [8th I. C.] 137–40, ill. **Hering, E. M.**—Die Oligophagie phytophager Insekten als Hinweis auf die Verwandtschaft der Rosaceae mit den Familien der Amentiferae. [8th I. C.] 74–79. **Jeannel, R.**—Origine et evolution des insectes. [8th I. C.] 80–86. **Kangas, E.**—Die Primärität und Sekundärität als Eigenschaften der Schädlinge. [8th I. C.] 792–98 (Engl. summary). **Kontuniemi, T.**—Gedanken zu gegenseitigen Tauschverbindungen der Museen. [8th I. C.] 145–46. **Malaise, R.**—New entomological evidences of a former trans-Pacific land-connection. [8th I. C.] 434–37. How to keep collected insects free from mould and pests in any climate. [8th I. C.] 926–27. **Merrell, D. J.**—Measurement

of sexual isolation and selective mating. [100] 4: 326–31. **Metcalf, Z. P.**—Methods in systematic entomology. [8th I. C.] 152–55. **Milner, M., D. L. Barney and J. A. Schellenberger**—Use of selective fluorescent stains to detect insect egg plugs on grain kernels. [80] 112: 791–92. **Nicholson, A. J.**—Progress in the control of Hypericum by insects. [8th I. C.] 76–79. **Palmén, E.**—Sea-drifts of insects as a factor in dispersal. [8th I. C.] 450–53. **Petersen, B.**—A method for experimental studies on Batesian mimicry. [8th I. C.] 457–59. **Rockwood, L. P.**—Entomogenous fungi of the family Entomophthoraceae in the Pacific northwest. [37] 43: 704–07.

ANATOMY, PHYSIOLOGY, MEDICAL—Agrell, I.—Hydrogen-activating enzymes during the insect metamorphosis. [8th I. C.] 192–98. **d'Aguilar, J.**—Remarques sur l'action toxique persistante de l'hexachlorocyclohexane dans le sol. [C. R. Acad. Sci.] 231: 1352–54. **Barlet, J.**—Sur la constitution des boucliers notaux des machilides. [8th I. C.] 535–40. **Bonnemaison, L.**—Remarques sur les facteurs d'apparition des ailes chez les Aphididae. [8th I. C.] 199–203. **Bradley, G. H.**—Insect control activities of the communicable disease center. [8th I. C.] **Busnel, R.-G.**—Nouvelles acquisitions sur les Pterines des insectes. [8th I. C.] 622–25. **Buck, J. B.**—Control of luminescence in Phengodes. [9] 108: Abstract No. 207. **Buck, J. B. and M. L. Keister**—Mechanism of gas transport through spiracles. [9] 108, Abstract No. 9. **Carayon, J.**—Les fosettes tegumentaires abdominales des Nabides. [8th I. C.] 207–13. **Cazal, P.**—Anatomie comparée des glandes retrocérébrales et du sympathique cephalique des insectes—son utilité pour la systématique. [8th I. C.] 116–23, ill. Conception histophysiologique des glandes retrecerebrales des insectes. *Ibid.* 214–17. **Chopard, L.**—Sur l'anatomie et le développement d'une blatte vivipare (Orthopt.). [8th I. C.] 218–22, ill. **Cory, E. N. and G. S. Langford**—The utilization of Bacillus popilliae Dutky, against Popillia japonica Newm. [8th I. C.] 883–86. **Couturier, A.**—Observations preliminaires sur la biologie d'un nematode (Mermithidae) parasite de la larve du hanneton commun (Melolontha melolontha L.). [8th I. C.] 637–39. **Crane, J.**—Comparative biology of Salticid spiders at Rancho Grande, Venezuela. Pt. V. Postembryological development of color and pattern. [95] 35: 253–61. **Crow, J. F. and W. C. Roberts**—Inbreeding and homozygosis in bees. [Genetics] 35: 612–21. **Eichler, W.**—Salzwasserverträglichkeit und Sommer-

phase des Anopheles atroparvus. [8th I. C.] 856–59. **Frey-Wyssling und K. Mühlethaler**—Der submikroscopische Feinbau von Chitinzellwänden (In Phycomyces, a fungus). [Vierteljahrsschr. Naturf. Gesell. Zürich] 95: 45–52, ill. **Fukaya, M.**—On the factor inducing the dormancy of the rice borer, Chilo simplex Butler. [8th I. C.] 223–25. **Gordon, R. M. and W. Crewe**—Man's reaction to the bites of certain arthropods. [8th I. C.] 66–68. **Grison, P.**—Influence de la temperature sur l'activite du doryphore (Leptinotarsa decemlineata Say) au stade imaginal. [8th I. C.] 226–34. **Gouin, F.**—Structure morphologique de labium Diptéroide; son évolution. [8th I. C.] 544–47. L'appareil buccal de Tipula sp. *Ibid.* 548–50, ill. La maxille et son évolution chez les Diptères Brachycères. *Ibid.* 551–53, ill. Évolution de la région clypéo-cibariale chez les Diptères Brachycères. *Ibid.* 554–56, ill. **Hardy, G. H.**—The twisting segments in Diptera. [28] 86: 346–47. **Herken, H. und I. Klempau**—Zur neurotropen Wirkung einiger Hexachlorcyclohexane. [Die Naturwiss.] 37: 493–94. **Hiestand, W. A.**—The resistance to nitrogen narcosis of insects, spiders and phalangids. [9] 108: Abstract No. 216. **Hodgkin, E. P.**—Malaria. (See under Diptera.) **Homann, H.**—Die Nebenaugen der Araneen. [Zool. Jahrb. (Anat.)] 71: 56–144, ill. **Kästner, A.**—Zur Entwicklungsgeschichte von Thelyphonus caudatus L. (Pedipalpi). 3. Teil. Die Entwicklung des Zentral nervensystems. [Zool. Jahrb. (Anat.)] 71: 1–55, ill. **Kern, F.**—Untersuchungen über den Fettstoffwechsel bei der Larva des Curculio caryae (Horn). [Mitth. Schweiz. Ent. Ges.] 23: 129–34, ill. **Lambers, D. H. R.**—An apparently unrecorded mode of reproduction. [8th I. C.] 235. **Larsén, O.**—Die dorsoventralen Muskeln im Pterothorax der neuropteroiden insecten. [8th I. C.] 557–60. **Leclerq, J.**—Sur quelques facteurs qui conditionnent la variabilité de la taille chez Tenebrio molitor L. [8th I. C.] 236–39. **Ludwig, D.**—Chemical constituents of the blood of the Japanese beetle (Popillia japonica Newman) larva. [9] 108: Abstract No. 208. **March, R. B. and L. L. Lewallen**—A comparison of DDT-resistant and non-resistant house flies. [37] 43: 721–22. **Michalk, O.**—Über die Färbungswandelungen, Generations- und Fortpflanzungsverhältnisse der mitteleuopäischen Eurydrema-Arten. (II Beitrag) (Hemipt.). [8th I. C.] 240–54. **Morley, D. W.**—The investigation of the learning ability of ants. [8th I. C.] 329–33. The division of labour in ants. *Ibid.* 523–29, ill. Artificially induced egg-laying in virgin ants. *Ibid.*

589–92. **Nicholson, A. J.**—Competition for food amongst Lucilia cuprina larvae. [8th I. C.] 277–81. **Nielsen, E. T**—Swarming habits of mosquitoes. [8th I. C.] 447–49 **Pal, R.**—The wetting of insect cuticle "Fundamental studies on insecticides." [8th I. C.[936–37. **Palm, N.-B.**—The use of vital staining methods in insect histology research. [8th I. C.] 282–88. Peristaltic movements of the malpighian tubes. *Ibid.* 293–96. **Passoneau, J. V. and C. M. Williams**—The moulting fluid of the Cecropia silkworm. [9] 108: Abstract No. 104. **Pavan, M.**—Iridomyrmecin, an antibiotic substance extracted from the Argentine ant (Iridiomyrmex pruinosus humilis Mayr). [8th I. C.] 863–65. Summary of original research on antibiotic substances of insects. *Ibid.* 866–69. **Pesson, P.**—Sur une phenomene de phoresie des spermatozoides par des cellules oviductaires, chez Aspidotus ostreaeformis Curt. (Homop., Cocc.). [8th I. C.] 566–70. **Power, M. E.**—The central nervous system of winged but flightless Drosophila melanogaster. An experimental study of the relation between motor ability and neuromorphogenesis. [41] 115: 315–39. **Raffy, A.**—L'autosterilization chez les chrysalides de Bombyx mori L. [C. R. Acad. Sci.] 231: 1345–46. **Sailer, R. I.**—A thermophobic insect (Plecoptera). [80] 112: 743. **Sanborn, R. C. and C. M. Williams**—Oxidative enzymes in relation to pupal diapause and adult development in the Cecropia silkworm. [9] 108: Abstract No. 103. **Schmidt, W. J.**—Bemerkungen über den blauen Chitinfarbstoff in den Schuppen der Nymphalide Nessaea obrinus L. [Zool. Anz.] 136: 70–72, 1941. **Schneider, F.**—Die Entwicklung des Syrphidenparasiten Diplazon fissorius Grav. (Hym. Ichn.) im uni-, oligo- und polyvoltinen Wirten und sein verhalten bei parasitärer Aktivierung der Diapauselarven durch Diplazon pectoratorius Grav. [Mitth. Schweiz. Ent. Ges.] 23: 155–94, ill. Die Abwehrreaktion des Insektenblutes und ihre Beeinflussung durch die Parasiten. [Vierteljahrsschr. Naturf. Gesell. Zürich] 95: 22–44, ill. **Schneidermann, H. A., N. Feder and C. M. Williams**—The respiration of the Cecropia silkworm in the presence of high pressures of carbon monoxide. [9] 108: Abstract No. 102. **Schöne, H.**—Zur Funktion der optischen Ganglien der Dytiscuslarve (Col., Dytiscid.). [Die Naturwiss.] 37: 527, ill. **Schremmer, F.**—Zur Morphologie und funktionellen Anatomie des Larvenkopfes von Chaoborus (Corethra auct.) v. d. Wulp. (Dipt., Chaoboridae). [Oesterr. Zool. Zeitschr.] 2: 471–515. **Silvestri, F.**—Segmentazione del corpo dei Colobognati (Diplopodi).

[8th I. C.] 571–76, ill. **Sotavalta, O.**—Some details and theories of the problem of flight of insects. [8th I. C.] 297–302, ill. **Spieth, H. T. and T. C. Hsu**—The influence of light on the mating behavior of seven species of the Drosophila melanogaster species group. [100] 4: 316–25. **Tahmisian, T. N. and D. M. Adamson**—The effect of anoxia on x-ray-induced injury in Melanoplus differentialis embryos. [9] 108, Abstract No. 15. **Telfer, W. H. and C. M. Williams**—An immunological study of the larval-pupal transformation of the Cecropia silkworm. [9] 108: Abstract No. 105. **Tóth, L.**—Protein metabolism and nitrogen fixation by means of microorganisms living in symbiosis with insects. [8th I. C.] 303–06. **Tuxen, S. L.**—Über ein neues, sehr abweichendes Stadium der postembryonalen Entwicklung der Proturen. [8th I. C.] 577–83, ill. **Van der Kloot, W. and C. M. Williams**—An experimental analysis of the spinning behavior of the Cecropia silkworm. [9] 108 Abstract No. 6. **Webb, J. E.**—The physical mechanism governing the rate of penetration of contact insecticides. [8th I. C.] 974–78, ill. **Weis-Fogh, T.**—An aerodynamic sense organ in locusts. [8th I. C.] 584–88. **Whiting, A. R.**—Failure of pupation of Ephestia larvae following exposure to x-rays. [9] 108: Abstract No. 206. **Wiesmann, R.**—Untersuchungen über die Diapause der Puppe der Kirschfliege Rhagoletis cerasi L. (Trypet.). [Mitth. Schweiz. Ent. Ges.] 23: 207–25. **Wigglesworth, V. B.**—The insect epicuticle. [8th I. C.] 307–09. **Wilde, J. de**—Developpement embryonnaire et postembryonaire du doryphore (Leptinotarsa decemlineata Say) en fonction de la temperature (Coleop.). [8th I. C.] 310–21. An experimental proof of the activity of the alary muscles in insects. *Ibid.* 322–28. **Winteringham, F. P. W., A. Harrison and R. B. Bridges**—Analysis of DDT derivatives by reversed-phase paper partition chromatography. [53] 166: 999. **Zuckerman, S., et al.**—A discussion on the measurement of growth and form. Under the leadership of S. Zuckerman. [Proc. Roy. Soc. Ser. B] 137: 433–523 (Art. by C. H. Waddington discusses growth of Drosophila wing (illus.), pp. 509–15).

ARACHNIDA AND MYRIOPODA—Chamberlin, R. V.—Some diplopods from Puerto Rico. [63] 63: 147–54. Some chilopods from Cuba. *Ibid.* 155–62. **Crane, J.**—Arachnida. (See under Anatomy.) **Crossley, D. A.**—A new species of nasal mite (Neonyssus columbae), from the pigeon (Acarina). [65] 52: 309–12 (k), ill. **Ewing, H. E.**—A redescription of four genera of chigger mites, together

with a description of a new genus and subgenus. [65] 52: 291–99, ill. **Fox, I.**—A new Tyroglyphid mite from Puerto Rico. [63] 63: 205–08, ill. **Hoffman, R. L.**—The status of the milliped Chelodesmus marxi Cook, and of the family Chelodesmidae. [63] 63: 185–88, ill. **Homann, H.**—(See under Anatomy.) **Jamnback, H. A.**—A water mite parasitic on fresh-water clams. [73] 57: 77–87. **Kästner, A.**—Pedipalpi. (See under Anatomy.) **Keegan, H. L.**—Dynatochaela primus n. sp., n. gen. (Laelaptidae). [46] 36: 511–14, ill. **Oudemans, A. C.**—Neue Funde auf dem Gebiete der Systematik und der Nomenklatur der Acari. [Zool. Anz.] 136: 177–86 (*), 1941. **Pierce, W. D.**—Pedipalpi. (See under Smaller Orders.) **Sayed, T.**—On the taxonomy of Tetranychid and allied genera. A new family and two new sub-families in Acarina. [8th I. C.] 1012–17 (k). **Schulze, P.**—Über Missbildungen der Schildzecken im allgemeinen sowie über Missbildungen von Hyalomma steineri Enigkianun n. ssp. im besonderen. [Z. f. Parasitenkunde] 14: 545–73, ill. **Silvestri, F.**—Diplopoda. (See under Anatomy.) **Verhoeff, K. W.**—Myriapoden der Insel Fernando Po. [Zool. Anz.] 136: 33–52, 89–98, ill., 1941.

SMALLER ORDERS—Asahina, S.—On the life-history of Epiophlebia soperstes (Odonata, Anisozyg.). [8th I. C.] 337–41. **Barlet, J.**—Machilidae. (See under Anatomy.) **Christianson, K. A.**—Massachusetts records of Cyphoderus assimilis (Collembola). [73] 57: 94. **Eichler, W.**—Mallophagen-Synopsis. II. Genus Stachiella. [Zool. Anz.] 136: 187–89, 1941. **Hall, C. C.**—The Trichoptera or caddice flies of Dallas Co. [Field and Lab., Dallas] 18: 165–78 (k), ill. **Hood, J. D.**—A new Hoplothrips from Cuba. [63] 63: 139–46, ill. **Jordan, H. E. K.**—On characteristics common to all known species of Suctoria and some trends of evolution in this order of insects. [8th I. C.] 87–95. **Larsén, O.**—Neuropteroids. (See under Anatomy.) **Pierce, D. W.**—Fossil Arthropods from onyx marble. [21] 49: 101–04 (Thysanura and Pedipalpi). **Pratt, H. D. and J. E. Lane**—Rediscovery of Taropsylla coloradensis (Baker) in Colorado (Siphonaptera). [65] 52: 305–07, ill. **Ray, D. L.**—Some new nearctic Collembola. [73] 57: 94–101, ill. **Sailer, R. I.**—Plecoptera. (See under Anatomy.) **Schmid, F.**—Le genre Halesochila Banks (Trich., Limnophilid.). [Mitth. Schweiz. Ent. Ges.] 23: 55–60, ill. **Strenger, A.**—Ein Beitrag zur Biologie von Forficula auricularia (Dermapt.). [Osterr. Zool. Zeitschr.] 2: 624–38. **Tuxen, S. L.**

—Protura. (See under Anatomy.) **Webb, J. E.**—Orthogenesis in the Anoplura. [8th I. C.] 185–91.

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IXth International Congress of Entomology

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New Journals

Entomologische Arbeiten aus dem Museum G. Frey. Volume 1 has been published by the Museum as of December 31, 1950, under the editorship of Hans Kulzer and consists of 284 pages with text-figures and four plates. It is planned to publish twice a year with a total of about 600 pages annually. Orders should be placed with: Buchhandlung Dr. E. Reitter, Waltherstrasse 27, München 15, Germany.

This journal is devoted almost exclusively to Coleoptera. In its preface, Georg Frey gives an outline of his personal history as a coleopterist and tells the story of the growth of his collections and the establishment of the Museum. Beginning as a collector of local insects, Frey's interest gradually increased so that he undertook collecting trips to other parts of Europe and began acquiring more beetles by trade and by purchase. Finally, he became interested in exotic species also and made trips to Africa, South America and the United States. Gradually, too, he attracted interested and capable co-workers so that the work on the collections became so extensive—with many species to be described, monographs and keys to be published—that it became necessary to undertake this new journal. This first issue contains ten papers, all on Coleoptera except one short paper on *Chrysis*. The more important ones are by H. Kulzer and by C. Koch on Tenebrionidae (the family best represented at the Museum) and by J. Bechyné (in French) on Chrysomelidae and Eumolpidae. All of these include American or Latin American forms. Other papers are by Breuning, Guignot, Koch Stöcklein and Schein.

Bonner Zoologische Beiträge. Published quarterly by the Zoologisches Forschungsinstitute und Museum Alexander Koenig, in Bonn a. Rhein, Germany, this journal was begun because of a lack of media for the publication of faunistic and systematic works. In keeping with the specialties of the museum, it will publish chiefly on vertebrates and on insects. The first issue contains seven papers (56 pages) on birds and bats and 37 pages on insects. Of the insect papers, those by Mell, Rensch, Buchholz and Klapperich are of interest to workers on American insects and are included under the titles in "Current Entomological Literature" in ENT. NEWS for March. Price: DM 3.50 per issue; DM 14.— per volume, less 10% for advance payment, from Comel Verlag Köln, Dellbrück, Gierather Strasse 45.

With regret, we note that **Entomon,** after a very fine first volume in 1949 (see ENT. NEWS, Oct. 1949), has not been able to continue publication.

EXCHANGES

This column is intended only for wants and exchanges, not for advertisements of goods for sale or services rendered. Notices not exceeding three lines free to subscribers.

These notices are continued as long as our limited space will allow; the new ones are added at the end of the column, and, only when necessary those at the top (being longest in) are discontinued.

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